

NCSU High Performance Charrette

College of Design

Leazar Hall Renovation

This report is a summary of the *High Performance Charrette* conducted at NCSU-College of Design – Raleigh on November 5, 2002

Funding provided by:

**State Energy Office, N.C. Department of Administration and
The U.S. Department of Energy, with State Energy Program funds
in cooperation with Triangle J Council of Governments**

Other sponsors:

NCSU College of Design
NCSU Office of the University Architect
NCSU Facilities Division
NC Solar Center, College of Engineering

Alicia Ravetto, AIA – Architect
Brown and Jones Architects
Cannon Architects
Design Harmony, Inc.
Winstead Wilkinson Architects



EXECUTIVE SUMMARY

North Carolina State University College of Design selected Cannon Architects to assist them in the design of the renovation of Leazar Hall. As part of the early schematic design process for the project, the University and Cannon Architects embraced the idea of holding a High Performance Charrette. A charrette is an intensive, focused brainstorming session involving a variety of experts, intended to provide an effective means to identify realistic and cost-effective high performance measures that could be implemented in the facility's design. Critical to the charrette and its documentation was funding from the State Energy Office, N.C. Department of Administration and the U.S. Department of Energy, with State Energy Program funds in cooperation with Triangle J Council of Governments. Ongoing relationships with these partners, and with the diverse and knowledgeable charrette participants, will accrue additional benefits to the University. These relationships will continue to aid the University in meeting its overall energy and environmental commitments long after the Leazar Hall project has been established as a leader in the field on the NCSU campus.



The charrette took place on November 5, 2002 at the College of Design, NCSU Raleigh campus. Its stated focus was to incorporate environmental excellence and high performance in the design of the University's Leazar Hall Renovation by using the High Performance Guidelines developed by the Triangle J Council of Governments. In his welcoming remarks, Dean Marvin Malecha noted the importance of balancing program and budget needs with high performance/"green" priorities. Approximately 50 individuals participated from various backgrounds and fields: the University (faculty, personnel, students, administration, etc.), the community, state agencies, and private companies. Four distinct environmental design areas were addressed in detail: site & water, energy, materials, and indoor environmental quality.

Local experts in "integrated design", in the Triangle J High Performance Guidelines and LEED, and in each of the four design areas added their expertise to the charrette. In addition, representatives from Cannon Architects and from the University presented project information. NCSU-College of Design students shared their creative thoughts and ideas on the new building while numerous other participants were asked to join in the brainstorming and to become "champions" of the charrette results.





Participants formed four small work groups to address topics relevant to the Leazar Hall Renovation. Each group looked at all high performance issues of the project and set priorities that they felt this project should address. At the conclusion of the day, all work groups presented the results of their discussions and then collaborated to determine a handful of Priority Action Items. The Priority Action Items determined by the Charrette participants are listed below.

Overall, the charrette proved to be fun and invigorating, and was filled with thoughtful insights for a realistic and strategic approach to incorporating high performance strategies into the renovation project. It laid good groundwork to expect that the design and construction of Leazar Hall will raise the “high performance bar” at North Carolina State University.



Priority Actions	
Actions	Champions
SITE: Preservation /Construction Staging	Sallie Ricks (Office of the University Architect) and David Tucker (Design Team)
ENERGY: Energy efficient Windows (Envelope), HVAC, and Lighting	Chris Garris/Tika Hicks (Cannon Architects), Engineers (Design Team), John Royal (Facilities Planning & Design), and Ed Sekmistrz (Facilities Operations)
WATER: Rainwater Collection	Nancy White (College of Design Faculty) and David Tucker (Design Team)
MATERIALS: C& D Waste Reduction and Occupant Waste Reduction and Recycling	Sarah Ketchum and Bill Beardall (NCSU Facilities Operations)
MATERIALS: Env. Preferable Products	Brad Moore and Others (NCSU)



Thanks to all for making this High Performance Charrette a very fun and productive event!

CHARRETTE PARTICIPANTS

Marvin Malecha	Dean of College of Design	Marvin_Malecha@ncsu.edu
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Nancy White	University Architect	Nancy_White@ncsu.edu
Mike Harwood	Director Facilities Operations	Michael_Harwood@ncsu.edu
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Jaianxin Hu	NCSU	jhu3@unity.ncsu.edu
Willis Dewitt	NCSU	wbdewitt@unity.ncsu.edu
Sallie Ricks	University Landscape Architect	Sallie_Ricks@ncsu.edu
Lisa Johnson	OUA - Water Efficiency	Lisa_Johnson@ncsu.edu
Tom Hunter	OUA - Energy and Atmosphere	Tom_Hunter@ncsu.edu
Brad Moore	OUA - Materials and Resources	Brad_Moore@ncsu.edu
Cindy Williford	OUA - Indoor Environmental Quality	Cindy_Williford@ncsu.edu
John Royal	FPD - Energy and Atmosphere	John_Royal@ncsu.edu
Sumayya Jones-Humienny	FPD - Indoor Environmental Quality	Sumayya_Jones-Humienny@ncsu.edu
David Wood	CM - Energy and Atmosphere	David_Wood@ncsu.edu
Bill Beardall	FO - Sustainable Sites	Bill_Beardall@ncsu.edu
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Robert Bishop	Little & Associates	rbishop@littleonline.com
Cullen Lovette		cullen@baker-inc.com

CHARRETTE GOALS and PROCESS

Charrette Goals:

1. Inform and educate charrette participants about the energy and environmental implications of designing and renovating an existing building on the NCSU-Raleigh campus. At the same time, clarify the “integrated approach” concept, encouraging the effective use of the Triangle J Council of Government High Performance Guidelines to help define and implement high performance strategies.



2. Support North Carolina high performance or “greening” efforts tailored to the renovation of the Leazar Hall on the campus of NC State University. Encourage charrette participants to work “hands-on” with facilitators (who have wide expertise with high performance design) to develop a strategic integrated approach to the project’s design/



construction approach and priority issues.

3. Identify economically viable and doable High Performance Priority Action items that the University could undertake that would incorporate high performance sustainable design measures into their Leazar Hall Renovation (and also with future university renovations).

4. Establish an initial database of contacts, champions, and partners for the identified sustainable design action items. Include (where possible) approximate costs and schedule implications. In addition, create a basis for the understanding of the levels of difficulty and commitment that will be needed required to fulfill each of the proposed action items.



5. Determine immediate next steps, champions, and strategies & technologies necessary to enable the

design team to implement the proposed High Performance Priority Action Items.

Charrette Process:

After initial presentations by the University, the Design Team, Triangle J Council of Government, the State Energy Office and Gail Lindsey, participants were each assigned to one of four work groups. In the morning, the groups analyzed the basic program requirements and discussed all high performance issues that were deemed important to the project. Lunch was served at Leazar Hall allowing some time for the participants to visit the building and become familiar with the existing conditions of the building shell, use, etc. After lunch, Gail Lindsey proposed the following basic task list for the remainder of the day:



1. SET PRIORITIES:

- What 5 to 10 items do your group want to “champion”?
- If you could only accomplish one item, what would it be?
- How will you make each of them happen?

2. BE SPECIFIC:

- Identify the “champions”, “partners” and “leaders” for each of these priority items
- What are the cost issues: \$, \$\$, or \$\$\$? (Little additional cost to high additional costs)
- What time issues are involved? (Additional research, O&M training, availability, etc.)
- What can be learned from others? (Case studies / mentors, what worked... what

3. SET SUCCESS INDICATORS:

- How will you get feedback and otherwise assess if the project is successful?



The pages that follow present the discussion results of the four work groups; under topic headings are both high performance strategies and, in boxed format, specific priority actions.

GROUP 1: OBSERVATIONS & RECOMMENDATIONS

PARTICIPANTS:

Alicia Ravetto, AIA (Facilitator) Architect
John Tector, College of Design Faculty
Chris Garris, (Design Team) Cannon Architects
Adam Johnson, (Design Team) Edmonson
Engineers, Electrical Engineer
John Royal, Facilities Planning & Design, Engineer
Sumayya Jones-Humienny, Facilities Planning &
Design, Architect
Ed Sekmistrz, Facilities Operations
Larry Hicks, Pilot Programs UNC-Chapel Hill
Trevor Dvorzsak, College of Design Student
Luke Buchanan, College of Design Student



ENERGY**\$\$\$ (Cost)****+++ (Value)****OVERALL RESOURCE: Alicia Ravetto, Architect****1) WINDOWS & DOORS:**

- Replace windows to reduce heat gain/losses
- Introduce Daylighting to reduce lighting load
- Use light shelves (only on the inside), baffles and glazing types as required by orientation (remove mezzanine, expose light monitors)
- Coordinate energy efficient, historic, and aesthetic issues
- Explore natural ventilation vs. controlled HVAC (operable vs. fixed windows)
- Implement more energy efficient lights + task lighting + zoning strategies

ENERGY (WINDOWS & DOORS):**\$\$\$****+++****CHAMPION: Chria Garris (Design Team)****RESOURCE: Carole Acquesta (UNC- cost issues)****PRIORITIES:**

- ☐ Avoid piecemeal approach (the thermal envelope is very important!)
- ☐ Use double glazing / low-e / argon filled windows
- ☐ Specify and install through glazing grilles
- ☐ Specify and install vinyl / aluminum clad wood windows
- ☐ Introduce daylighting and daylight controls (i.e. interior light shelves)

POSSIBLE PARTNERS:

- ☐ CAMPUS DESIGN REVIEW PANEL (involve them early in the process)

POSSIBLE BARRIERS:

- ☐ Additional effort but no additional time

SUCCESS INDICATORS:

- ☐ LCC/LCA to demonstrate success and value
- ☐ Performance based specs
- ☐ Historic / aesthetic issues
- ☐ Post occupancy evaluations (possibly graduate student work/ grant/class project)

CRITICAL ISSUE: CHECK THE ENTIRE ENVELOPE (roof / walls / etc.)*2) HVAC:**

- Provide good air flow and meet fresh air intake requirements
- Review lifecycle costs for central loop vs. stand alone system & for initial vs. long term operating costs
- Determine special HVAC and exhaust needs required for painting studios and shops

ENERGY (HVAC):

\$

+++

PRIORITIES:

- ☐ Replace existing system (it is a requirement so the cost issue is not as relevant) with more efficient HVAC
- ☐ Add make up air
- ☐ Compartmentalize which could have a big impact on the HVAC

POSSIBLE PARTNER:

- ☐ Alan Daeke (Utilities)

IEQ

- Train users (STUDENTS) to reduce use of toxic substances (currently no treated wood is allowed in the carpentry shop)
- Use occupancy sensors
- Properly install and maintain all building assemblies to reduce leaks and the introduction of moisture / mildew problems

IEQ -- LIGHTING):

\$\$

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CHAMPIONS: John Shanahan & Ray Winstead
Adam Johnson (Design Team / Electrical Engineer)

PRIORITIES:

- ☐ Install efficient and effective lighting
- ☐ Specify and install occupancy sensors and other lighting controls
- ☐ Combine effective general lighting with task lighting

POSSIBLE PARTNER:

- ☐ Green Lights Program at NCSU

MATERIALS

- Conduct a baseline assessment of existing hazardous materials (asbestos and lead paint, mold, mildew, etc.)
- Specify that new materials meet the LEED and Triangle J High Performance guidelines for carpet, paint, etc. (low VOC, etc.)
- Retain existing long use materials (eg. terrazzo floors) whenever possible
- Specify low maintenance finishes
- Recycle construction and demolition debris

MATERIALS:**CHAMPION: Brad Moore (NCSU)****PRIORITIES:**

- ❑ Reuse existing floors (terrazzo, etc.) whenever possible
- ❑ Use environmentally preferred products (can be from \$ to \$\$\$)
- ❑ Recycle construction and demolition debris

WATER

- Conserve water by collecting water for graywater use in toilets and/or irrigation [Nancy White provided the following calculation to have an idea of the system size 35,000 gallons/month Cistern 20'x20'x15' = 1 ½ month capacity]
- Install low flow plumbing fixtures and waterless urinals (Check maintenance and access issues)

WATER:**\$\$****+****CHAMPION: Nancy White (NCSU Faculty)****PRIORITY:**

- ❑ Specify and implement a water reclamation roof system



GROUP 2: OBSERVATIONS & RECOMMENDATIONS

PARTICIPANTS:

Carl Winstead, AIA (Facilitator)
Nancy White, (Faculty), NCSU
Susan Cannon, (Design Team) Cannon Architects
Stephen Berg, (Design Team) Cannon Architects
Charles Crawl, (Design Team) Edmondson Engineers
Michael Harwood, Office of the University Architect
Lisa Johnson, OUA Water Efficiency
David Wood, Construction Management
Shashi Rao, Facilities Operations
Carole Acquesta, Pilot Programs
Willis Dewitt, NCSU Student
Cullen Lovette, Developer



SITE & STORMWATER MANAGEMENT

- Determine possible impacts of construction area
- Preserve existing landscape
- Investigate light pollution issue
- Integrate and evaluate site strategies with other environmental aspects AND with EDUCATION of students, faculty, and visitors (“Environmental Art”)

ENERGY

- Evaluate performance and efficiency of existing and new mechanical systems
- Review energy use related to shell/building envelope/windows

IEQ

- Assess baseline conditions for existing lighting and determine strategies for more energy efficient and effective lighting/ daylighting
- Address Indoor Air Quality Issues (Use LEED and Triangle J High Performance Guidelines for top priority strategies)

IEQ – (DAYLIGHTING/ LIGHTING):

\$\$-\$\$\$

**CHAMPIONS: Lisa Johnson (Office of the University Architect)
Design Team Members**

PRIORITIES:

- ☐ Reuse existing skylight/clerestory
- ☐ Control daylight from existing areas of glazing
- ☐ Investigate glazing options as well as window replacements or modifications
- ☐ Install sunscreens/lightshelves
- ☐ Coordinate daylight and artificial lighting

POSSIBLE PARTNERS:

- ☐ Window Suppliers
- ☐ Wayne Place at NCSU
- ☐ EPA in RTP (Contacts: Chris Long and Pete Schubert)

POSSIBLE BARRIERS:

- ☐ State bidding requirements
- ☐ Cost and time (including possibility of additional consultants)
- ☐ Aesthetics

***CRITICAL ISSUE: THIS INFO. IS NEEDED ON OR BEFORE FEBRUARY 2003**

MATERIALS

- Establish and implement a Construction Waste Management Plan
- Use environmentally preferable products and reuse existing durable materials where feasible and practical
- Design for user recycling and directly connect to educational aspects of students, faculty, and other users

WATER

- Establish and implement a Water Management Plan that addresses the following: stormwater, building systems, rainwater, toilets, irrigation, and water treatment
- Explore educational opportunities addressing water management
- Identify waste water treatment strategies, options, and issues
- Benchmark water fixtures and DOE requirements
- Check population of building occupants and document any water use changes over time
- Investigate existing sprinkler system
- Determine possibility of a roof water collection system

WATER:

\$\$

CHAMPION: Nancy White and David Wood (NCSU)

PRIORITIES:

- ☐ Study and verify water demands (Review project program information in regard to water)
- ☐ Check plumbing code in reference to rainwater collection and use (Potable vs Non-potable)
 - a) Potable: Sensors at certain locations, alternate fixtures, possible recycling, etc.
 - b) Non-potable: flushing and irrigation

POSSIBLE BARRIERS:

- ☐ Cost
- ☐ Existing utilities
- ☐ Size, availability, and location
- ☐ Appearance

***CRITICAL ISSUE: THIS INFO. IS NEEDED ON OR BEFORE FEBRUARY 2003**

****MEASUREMENT & VERIFICATION of SYSTEMS**

- Determine baseline conditions (benchmarks) for energy and water use (possibly others) and set realistic goals to reduce consumption in these areas
- Check existing systems, code requirements, and innovation standards* (*such as those found in LEED and the Triangle J High Performance Guidelines)

MEASUREMENT & VERIFICATION:

PRIORITIES:

- ❑ Establish baseline data especially with Energy and Water
- ❑ Establish methods for measurements (solar power, central energy distribution, green power, sustainable energy, etc.)
- ❑ Identify ways to measure life cycle costs and begin documenting LCC
- ❑ Set goals to reduce water and energy consumption



GROUP 3: OBSERVATIONS & RECOMMENDATIONS

PARTICIPANTS:

Charles Brown, (Facilitator) Brown & Jones Architects

Judy Kincaid, Triangle J Council of Governments

Tika Hicks, (Design Team) Cannon Architects

Roger Clark, (Design Team), Cannon Architects and NCSU Faculty

Michael Edmondson and Tommy Weaver (Design Team) Edmondson Engineers

Robert Bishop, Little and Associates

Cindy Williford, Office of the University Architect

Alan Daeke, Facilities Operations

Greg Selzer, NCSU

Manny Amaro, Pilot Programs



ENERGY

1) ENVELOPE:

- Replace existing roof
- Investigate original glazing
- Check existing thermal envelope (barrier wall and ceiling insulation)

ENERGY (ENVELOPE):

CHAMPION: Tika Hicks, Cannon Architects (Design Team)

PRIORITIES:

- ☐ Utilize existing fenestration with new windows (\$\$\$ +++)
 - a) PRO: Better energy performance and quality of space
 - b) CON: Historic appearance difficulty and high cost
- ☐ Integrate daylighting with artificial lighting [controls] (\$ +)
- ☐ Open existing clerestory (\$\$\$ ++)
- ☐ Install transoms for borrowed light (\$\$ +)
- ☐ Use reflective interior surfaces (\$ +)
- ☐ Install new skylights (\$\$\$ ++)

POSSIBLE PARTNERS:

- ☐ Edmondson Engineers (Energy benefits)
- ☐ NC Solar Center, quotes, manufacturers (Cost of historic appearance)

POSSIBLE BARRIERS:

- ☐ Fixed orientation (different glazing per orientation)
- ☐ Budget
- ☐ Historic character

2) OTHER:

- Investigate a raised floor (review expense, flexibility, “dancing elephants” issue, etc.)
- Explore Building Management Systems (ventilation - especially CO2 monitoring, lighting, make-up air, and HVAC system)
- Engage students and faculty in high performance education and involvement
- Measure efficiency of systems over time
- Investigate strategies for energy efficient hot water
- Review appropriateness of existing HVAC and electrical systems (determine best approach --start from scratch or service existing)

IEQ

1) AIR QUALITY:

- Research low VOC adhesives, paints, carpets, etc.
- Investigate central air space (review enforcement issues)
- Determine proximities of spaces (especially explore shop exhaust issues)
- Involve students in air quality issues and documentation

2) DAYLIGHTING/LIGHTING:

- Investigate the use of transoms for borrowed light, opening the existing clerestory, etc.
- Check the depth of the building while exploring daylighting options
- Install new glazing in existing window openings and clerestory opening
- Replace existing roof and investigate new roof openings for daylighting
- Explore options for sun control (light shelves, trees, glazing options)
- Coordinate daylighting strategies and HVAC strategies with artificial light and lighting controls (remember the 24/7 occupancy of this building)
- Investigate energy efficient and effective fixture strategies, automated controls, and lighting levels
- Check current lighting standards used around the University

MATERIALS

- Keep existing terrazzo flooring whenever possible
- Use materials as educational artifacts
- Inventory salvagable materials
- Conserve, reclaim, and recycle materials
- Use environmentally preferable products

WATER

- Collect rain water from the roof – Explore spaces for cisterns
- Use graywater for irrigation and other uses (?)
- Install low-flow fixtures (investigate waterless urinals)
- Explore rain gardens to lower stormwater runoff
- Implement independent water metering to collect water use data

****BUILDING as “LEARNING LAB”**

- Identify ways that this building could educate students, faculty, and other occupants about high performance building strategies and their direct impact on our lives and surrounding environment

BUILDING as “LEARNING LAB”:

PRIORITIES:

- ❑ Overtly present educational information throughout the building on high performance strategies (especially those related to energy efficiency, daylighting, and environmentally preferable products)

POSSIBLE PARTNERS:

- ❑ NC Solar Center
- ❑ Fatih Rifki and Wayne Place at College of Design NCSU
- ❑ Dale Brentrup at UNC-Charlotte Architecture School
- ❑ Daylighting Consortium
- ❑ University of Washington Daylighting Lab
- ❑ Carnegie Mellon
- ❑ Environmental Building News
- ❑ LEED and Triangle J High Performance Case Studies

POSSIBLE BARRIERS:

- ❑ Additional time and effort



GROUP 4: OBSERVATIONS & RECOMMENDATIONS

PARTICIPANTS:

Dona Stankus, AIA (Facilitator) NCSU – Solar Center
Jolie Frasier, (Design Team) Cannon Architects
David Tucker (Design Team) Edmudson Engineers
Sallie Ricks, Office of the University Architect
Tom Hunter, Office of the University Architect
Sarah Ketchum, Facilities Operations
Bill Beardall, Facilities Operations
Gina Shoemaker, Pilot Programs
Carol Woodyard, NCSU



SITE

1) CONSTRUCTION STAGING & LANDSCAPE PRESERVATION:

- Coordinate construction staging and landscaping preservation

SITE (CONSTRUCTION STAGING & LANDSCAPE PRESERVATION):

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CHAMPIONS: Sallie Ricks, University Landscape Architect
Bill Beardall, Facilities Operations (Sustainable Sites)

PRIORITIES:

- ☐ Reduce negative impacts of construction on existing landscape

POSSIBLE PARTNERS:

- ☐ Construction Management
- ☐ Grounds Management

POSSIBLE BARRIERS:

- ☐ Contractor attitude

SUCCESS INDICATORS:

- ☐ Vegetation lives
- ☐ No site creep

2) EXTERIOR SITE LIGHTING:

- Implement energy efficient and effective exterior lighting

SITE (EXTERIOR LIGHTING):

\$

CHAMPIONS: Sallie Ricks, University Landscape Architect

PRIORITIES:

- ☐ Reduce energy consumption and reduce exterior light pollution

POSSIBLE BARRIERS:

- ☐ Additional time

SUCCESS INDICATORS:

- ☐ Energy savings
- ☐ Possible reduction in light pollution

ENERGY

- Specify and install energy efficient daylighting/lighting (\$\$)
- Maintain good access on all mechanical systems for future retrofits (\$\$\$)
- Establish baseline data of existing water and energy use (\$)
- Monitor existing chiller load and air quality (\$ -- may be difficult)

IEQ

- Investigate daylighting, energy efficient lighting and controls (i.e. occupancy sensors)

MATERIALS

1) CONSTRUCTION WASTE MANAGEMENT:

- Establish and implement a Construction Waste Management Plan.

MATERIALS (CONSTRUCTION WASTE MANAGEMENT):

\$-\$\$\$

CHAMPIONS: Sarah Ketchum and Carol Woodyard (NCSU)

PRIORITIES:

- ☐ Time (Learning curve)

POSSIBLE PARTNERS:

- ☐ IBM & RTP Materials reclamation

POSSIBLE BARRIERS:

- ☐ Time (Learning curve)
- ☐ University specs
- ☐ Attitudes and habits

SUCCESS INDICATORS:

- ☐ Avoided waste

2) OTHER:

- Use environmentally preferable products (\$)
- Reuse of existing or salvaged materials (\$)
- Design for user reduce/reuse/recycle program/education (\$\$)

****BUILDING as “TEACHING TOOL”**

- Identify ways that this building could educate students, faculty, and other occupants about high performance building strategies and their direct impact on our lives and surrounding environment

BUILDING as “TEACHING TOOL”:

\$-\$\$\$

CHAMPIONS: School Users and Design Team

PRIORITIES:

- ❑ Become a “leading example/case study” of high performance design – document “lessons learned” and share with others

POSSIBLE PARTNERS:

- ❑ Sarah Ketchum (OWRR) outreach and development as a tool
- ❑ College of Design and College of Engineering outreach

POSSIBLE BARRIERS:

- ❑ Additional time and effort (coordination and documentation)
- ❑ Codes

SUCCESS INDICATORS:

- ❑ Documented case study to share (also documentation of process)



ATTACHMENTS:

Charrette Agenda
Triangle J High Performance Guidelines – Leazar Hall by Brad Moore
Case Study Template
Sustainable Websites

Additional websites and resources:

National Websites:

- EPA Procurement guidelines www.ergweb2.com/cpg
- CSI Division materials www.oikos.org
- Energy Star Program www.energystar.gov
- Environmental Building News www.buildinggreen.com

NCSU Resources

- Sustainable coalition lucylaffitte@ncsu.edu
- Recycling/waste reduction sarah_ketchem@ncsu.edu
- Renewable/Energy efficiency www.ncsc.ncsu.edu
- Storm water/site nancy_white@ncsu.edu

